

**CURRICULUM
FOR THE ACADEMIC YEAR 2022-2023**

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

M.Tech. (Computer Science & Engineering)

II SEMESTER Syllabus



**POOJYA DODDAPPA APPA COLLEGE OF ENGINEERING
(An autonomous college under VTU)
KALABURAGI**

About the Institute

Poojya Doddappa Appa College of Engineering was the first Institution established by the Hyderabad Karnataka Education Society in 1958 by Sri. Mahadevappa Rampure, with an aim to impart quality education to the youth of Hyderabad Karnataka region. The college is spread over 71 acres of land and has sprawling complex housing student activity center, 1000 seat capacity auditorium and gardens and greenery around.

At present the total intake of the Institute stands at 980 in 11 UG programmes, 193 in 10 PG programmes and 197 Research Scholars pursuing their Ph.D. in 12 Research centres. UGC has approved the academic Autonomy from 2009-10 to 2014-15 and extended up to 2018-19. College has been declared fit under section 2(f) and 12 (B) of UGC Act 1956. The Institute has been awarded with Bharatiya Vidya Bhavan National Award for an Engineering College having Best Overall Performance for the year 2017 by ISTE (Indian Society for Technical Education).

The College receives grant in aid funds from State Government for five departments. A number of research projects have been funded by MHRD/AICTE which includes also funds for modernization of laboratories. The institute is one among nine Institutions identified by Ministry of ITBT, Govt. of Karnataka for setting-up Incubation Centre. Innovative ideas of the students are encouraged to be translated into commercial products for the benefit of society. A fund of Rs.3 Lakh per project is being financed by Ministry of ITBT, Govt. of Karnataka. The institute is declared as the best NAIN Centre for submitting ten innovative projects for 2016. Several UG student projects are funded by Karnataka State Council for Science and Technology every year.

The college has got a central library facility which houses also a separate digital library with 40 PCs. The library has got large collection of books along with e-journals which is upgraded every year by allocation of necessary funds. Training & Placement Computer Centre with 120 Core i5 systems with LCD Screen has been setup to provide facility for conducting Training, Workshops, Seminars, Conferences, Online examination etc. Separate hostel facility is provided for boys and girls. An exclusive Examination Centre housing state of the art facilities has been constructed. 100 Mbps internet facility and wi-fi facility are provided for the students. The student activity center houses sports facilities, canteen facility and three seminar halls.

The college has acquired autonomous status for both UG and PG programs since 2007-08 and is one among six colleges in Karnataka State to acquire the autonomous status for both UG and PG programs. The college is one among 14 colleges selected under TEQIP scheme, sponsored by World Bank. The college is selected for TEQIP-III as Mentoring Institution for BIET, Jhansi, UP by NPIU New Delhi. The Institute, taking the advantage of academic autonomy, believes in preparing the students through OBE adopting Choice Based Credit System (CBCS) and Continuous Assessment and Grading Pattern of examination. Also a one year diploma course in Interior design has been started by the Architecture department. The curriculum is framed with wide interaction with alumni and Industry resource persons so as to impart necessary updated skills in the students.

Highly qualified and dedicated human resource, state of the art facilities, effective institute-alumni and industry-institute interaction make the learning process a unique and satisfying experience at Poojya Doddappa Appa College of Engineering.

About the Department

The Computer Science and Engineering department was started in the year 1984 with an intake of 40 students for UG. The department has seen phenomenal growth and now the department has increased UG intake to 120 students and offering two Post Graduation programmes: PG (Computer Science and Engineering with an intake of 25 students) and PG (Computer Network and Engineering with an intake of 18 students). The department is offering research program under its recognized research center. The department is having state-of-the-art computing facilities with high speed internet facilities and laboratories. The department library provides useful resources like books and journals. The department has well qualified and experienced teaching faculty. The department has been conducting several faculty development programs and student training programs.

Institute Vision

To be an institute of excellence in technical education and research to serve the needs of the Industry and society at local and global levels.

Institute Mission

1. To provide a high-quality educational experience for students with values and ethics that enables them to become leaders in their chosen professions.
2. To explore, create, and develop innovations in engineering and science through research and development activities.
3. To provide beneficial service to the national and multinational industries and Communities through educational, technical, and professional activities.

Department Vision

To become a premier department in computer education and research to prepare highly competent IT professionals to serve industry and society at local and global levels.

Department Mission

M1 - To impart high quality professional education to become a leader in Computer Science and Engineering.

M2 - To achieve excellence in Research for contributing to the development of the society.

M3 - To inculcate professional and ethical behavior to serve the industry.

Program Educational Objectives (PEO)

| | |
|--------------|---|
| PEO1: | To prepare graduates with core competencies in mathematical and engineering fundamentals to solve and analyze Computer Science and Engineering problems |
| PEO2: | To adapt to evolving technologies and tools for serving the society |
| PEO3: | To perform as a team leader, effective communicator and socially responsible computer professional in multidisciplinary fields following ethical values |
| PEO4: | To encourage students to pursue higher studies, engage in research and to become entrepreneurs |

PROGRAM OUTCOMES

Engineering Graduates will be able to:

01. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems.
02. **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
03. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
04. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
05. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
06. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
07. **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
08. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
09. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. **Project management and finance:** Demonstrate knowledge and understanding the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. **Life-long learning:** Recognize the need for, and have the preparation and ability engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcomes (PSOs):

| | |
|-------|---|
| PSO1: | Acquire competency in hardware and software working principles to analyze and solve Computing problems. |
| PSO2: | Design quality software to develop scientific and business applications following Software Engineering practices. |
| PSO3: | Apply cutting edge technologies using modern tools to find novel solutions ethically to Existing problems. |

Scheme of Teaching and Examination – 2022-2023
M.Tech. Computer Science & Engineering
Choice Based Credit System (CBCS) & Outcome Based Education System (OBE)

Year: I

Semester: II

| Sl.No | Course | Course Code | Course Title | Teaching Hours per Week | | | Examination | | | Credits | |
|-------|---------|-------------|---------------------------------|--|--------------------|---|-------------------|------------|------------|------------|-------------|
| | | | | Theory | Practical/ Seminar | Skill Development Activities (Hours are for Interaction Between faculty and students) | Duration in hours | CIE Marks | SEE Marks | | Total Marks |
| | | | | L | P | SDA | | | | | |
| 1 | PCC | 22PCS21 | Cloud Computing | 2 | 0 | 2 | 3 | 50 | 50 | 100 | 3 |
| 2 | IPCC | 22PCS22 | Machine Learning | 3 | 2 | 0 | 3 | 50 | 50 | 100 | 4 |
| 3 | PEC | 22PCS23X | Professional Elective 1 | 3 | 0 | 0 | 3 | 50 | 50 | 100 | 3 |
| 4 | PEC | 22PCS24X | Professional Elective 2 | 3 | 0 | 0 | 3 | 50 | 50 | 100 | 3 |
| 5 | MPS | 22PCS25 | Mini Project with Seminar | 0 | 4 | 2 | -- | 100 | -- | 100 | 3 |
| 6 | PCCL | 22PCS26 | Internet and Data Analytics Lab | 0 | 4 | 0 | 3 | 50 | 50 | 100 | 2 |
| 7 | AUD/AEC | 22APC27 | NPTEL | Classes and evaluation procedures are as per the policy of the online course providers | | | | | | PP | |
| | | | TOTAL | 11 | 10 | 4 | 15 | 350 | 250 | 600 | 18 |
| | | | | | | | | | | | |

Note: PCC: Professional core courses, PEC: Professional Elective Courses, IPCC-Integrated Professional Core Courses. MPS-Mini Project With Seminar; AUD/AEC; Audit Courses/ Ability Enhancement Courses(Mandatory)
MOOCs course can be completed before completion of IV Semester.

| Professional Elective 1 | |
|----------------------------|---|
| Course Code under 22PCS23X | Course title |
| 22PCS231 | Managing Big Data |
| 22PCS232 | Service Oriented Architecture |
| 22PCS233 | Software Engineering & Quality Assurance |
| 22PCS234 | Advanced Operating System |

| Professional Elective 2 | |
|----------------------------|--|
| Course Code under 22PCS24X | Course title |
| 22PCS241 | Advanced Database Management System |
| 22PCS242 | Storage Area Networks |
| 22PCS243 | Business Intelligence |
| 22PCS244 | Compiler Design |

NOTE:

1. Mini Project with Seminar: This may be hands-on practice, survey report, data collection and analysis, coding, [mobileapp](#) development, field visit and report preparation, modeling system, simulation, analyzing and authenticating, case studies, etc. CIE marks shall be awarded by committee comprising of HOD as Chairman, Guide/co-guide, if any, and senior faculty of the department. Students can present the seminar based on the completed mini-project. Participation in the seminar by all post graduate students of the program shall be mandatory.

The CIE marks awarded for Mini-Project work and Seminar, shall be based on the evaluation of Mini Project work and Report, Presentation skill and performance in Question-and-Answer session in the ratio 50:25:25. Mini-Project with Seminar shall be considered as a head of passing and shall be considered for vertical progression as well as for the award of degree. Those, who do not take-up/ complete the Mini Project and seminar shall be declared as fail in that course and have to complete the same during the subsequent semester. There is no SEE for this course.

2. Internship: All the students shall have to undergo a mandatory internship of **08 weeks** during the vacation of II and III semesters. A University examination shall be conducted during III semester and the prescribed internship credit shall be counted in the same semester. The internship shall be considered as a head of passing and shall be considered for vertical progression as well as for the award of degree. Those, who do not take-up/ complete the internship shall be declared as fail in the internship course and have to complete the same during the subsequent University examination after satisfying the internship requirements.

AUTONOMOUS SYLLABUS FOR M. Tech II SEMESTER 2022-2023

| | | |
|---|---------------------------|-----------------------|
| Course Title: CLOUD COMPUTING | | |
| Subject Code: 22PCS21 | Credit: 3 | CIE:50 |
| Number of Lecture Hours/Week | 2 Hrs +2 Hrs (SDA) | SEE:50 |
| Total Number of Lecture Hours | 42 | SEEHours:03 |
| Prerequisites: Networking, Distributed system and Database management system. | | |
| Course Objectives: | | |
| <ul style="list-style-type: none"> • Understand cloud computing, infrastructure, services. • Learn Virtualization and scheduling techniques. | | |
| MODULES | | Teaching hours |
| Module-I | | 09 Hrs |
| <p>Introduction: Cloud Computing Overview, Applications, Internets and the cloud, first movers in the cloud, your organization and cloud Computing, When you can Use Cloud Computing, Benefits, Network- centric computing and network centric content, peer-peer systems, Cloud computing an old idea whose time has come, Cloud computing delivery models and services, Ethical issues, Cloud vulnerabilities, Major challenges faced by cloud computing.</p> <p>Cloud Infrastructure: Cloud computing at Amazon, Cloud computing the Google perspective Microsoft Windows Azure and online services, Open-sources software platforms for private clouds, Cloud storage diversity and vendor lock-in, Energy use and ecological impact, Service level agreements, User experience and software licensing.</p> | | |
| Module-II | | 08 Hrs |
| <p>Cloud Computing: Application Paradigms: Challenges of cloud computing, Architectural styles of cloud computing, Workflows: Coordination of multiple activities, Coordination based on a state machine model: The Zookeeper.</p> <p>The Map Reduce programming model, A case study: The Grep The Web application, Cloud for science and engineering, High-performance computing on a cloud, Cloud computing for Biology research.</p> | | |
| Module-III | | 08 Hrs |
| <p>Cloud Resource Virtualization: Virtualization, Layering and virtualization, Virtual machine monitors, Virtual Machines, Performance and Security, Isolation, Full virtualization and paravirtualization, Hardware support for virtualization, Case Study: Xen a VMM based, paravirtualization, Optimization of network virtualization, vBlades.</p> | | |
| Module-IV | | 08 hrs |
| <p>Cloud Resource Management and Scheduling: Policies and mechanisms for resource management, Application of control theory to task scheduling on a cloud, Stability of a two-level resource allocation architecture, Feedback control based on dynamic thresholds, Coordination of specialized autonomic performance managers, A utility-based model for cloud-based Web services, Resourcing bundling Combinatorial auctions for cloud resources.</p> | | |

| Module– V | | | 09 Hrs |
|--|------------|---|---------------|
| <p>Scheduling algorithms for computing clouds: Fair queuing, Start-time fair queuing, borrowed virtual time, Cloud scheduling subject to deadlines, Scheduling Map Reduce applications subject to deadlines, Resource management and dynamic scaling, Exercises and problems.</p> <p>Cloud Security: Cloud security risks, Security: The top concern for cloud users, Privacy and privacy impact assessment, Trust, Operating system security, Virtual machine Security, Security of virtualization.</p> | | | |
| <p>Question paper pattern: The question paper will have ten questions. There will be 2 questions from each module, covering all the topics from a module. The students will have to answer 5 full questions, selecting one full question from each module.</p> | | | |
| <p>Textbooks:</p> <ol style="list-style-type: none"> 1. Antony T Velte,“ Cloud Computing: A Practical Approach”, McGraw Hill. 2. Dan C Marinescu:“ Cloud Computing Theory and Practice”, Elsevier(MK)2013. | | | |
| <p>Reference Books:</p> <ol style="list-style-type: none"> 1. Larry L. Peterson and Bruce S Davie: Computer Networks: A Systems Approach, Fifth Edition, Elsevier, 2011. 2. Tanenbaum: Computer Networks,4thEd, Pearson Education/PHI,2003. 3. William Stallings: Data and Computer Communications, 8thEdition, Pearson Education, 2012. | | | |
| <p>Course outcomes: On completion of the course, the student will have the ability to:</p> | | | |
| Course Code | CO# | Course Outcome (CO) | Blooms Level |
| 22PCS21 | CO1 | Describe Cloud delivery Models, Cloud Infrastructure. | C1 |
| | CO2 | Discuss the key dimensions and challenges of Cloud Computing and Architecture and Workflow. | C2 |
| | CO3 | Demonstrate Scheduling and Resource management in Cloud. | C3 |
| | CO4 | Explain Network Support and Storage Systems in Cloud | C6 |
| | CO5 | Illustrate Security in Cloud and Design Cloud Applications | C4 |

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| Course Title: MACHINE LEARNING | | |
| Subject Code: 22PCS22 | Credit:4 | CIE:50 |
| Number of Lecture Hours/Week | 3 Hrs (Th) + 2 Hrs (Practical) | SEE:50 |
| Total Number of Lecture Hours | 42 | SEE Hours: 03 |
| Pre-requisite: Mathematical Foundation of Computer Networks, Analysis and Design of Algorithm | | |
| Course Objectives: | | |
| <ul style="list-style-type: none"> • Understand types, concepts of learning • Design a system using various types of learning. | | |
| MODULES | | Teaching Hours |
| Module –I | | |
| <p>Introduction, Concept Learning And Decision Trees : Learning Problems – Designing Learning systems, Perspectives and Issues – Concept Learning – Version Spaces and Candidate Elimination Algorithm – Inductive bias – Decision Tree learning – Representation – Algorithm – Heuristic Space Search.</p> <ol style="list-style-type: none"> 1. Implement and demonstrate the FIND-S algorithm for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .CSV file. 2. Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample. | | 08 Hrs |
| Module-II | | |
| <p>Neural Networks And Genetic Algorithms: Neural Network Representation – Problems – Perceptrons – Multilayer Networks and Back Propagation Algorithms – Advanced Topics – Genetic Algorithms – Hypothesis Space Search – Genetic Programming – Models of Evolution and Learning.</p> <ol style="list-style-type: none"> 1. For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples 2. Build an Artificial Neural Network by implementing the Back propagation algorithm and test the same using appropriate data sets. | | 08 Hrs |
| Module-III | | |
| <p>Bayesian And Computational Learning: Bayes Theorem – Concept Learning – Maximum Likelihood – Minimum Description Length Principle – Bayes Optimal Classifier – Gibbs Algorithm – Naïve Bayes Classifier – Bayesian Belief Network – EM Algorithm – Probably Learning – Sample Complexity for Finite and Infinite Hypothesis Spaces – Mistake Bound Model.</p> <ol style="list-style-type: none"> 1. Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets | | 09 Hrs |

| | |
|--|---------------|
| <p>2. Write a program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set. You can use Java/Python ML library classes/API.</p> <p>3. Apply EM algorithm to cluster a set of data stored in a .CSV file. Use the same data set for clustering using k-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering. You can add Java/Python ML library classes/API in the program.</p> | |
| <p style="text-align: center;">Module- IV</p> <p>Instant Based Learning And Learning Set Of Rules: K- Nearest Neighbor Learning – Locally Weighted Regression – Radial Basis Functions – Case- Based Reasoning – Sequential Covering Algorithms – Learning Rule Sets – Learning First Order Rules – Learning Sets of First Order Rules – Induction as Inverted Deduction – Inverting Resolution.</p> <p>1. Write a program to implement k-Nearest Neighbour algorithm to classify the iris data set. Print both correct and wrong predictions. Java/Python ML library classes can be used for this problem.</p> <p>2. Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select appropriate data set for your experiment and draw graphs.</p> | 09 hrs |
| <p style="text-align: center;">Module – V</p> <p>Analytical Learning And Reinforced Learning: Perfect Domain Theories – Explanation Based Learning – Inductive-Analytical Approaches - FOCL Algorithm – Reinforcement Learning – Task – Q-Learning – Temporal Difference Learning.</p> | 08 Hrs |
| <p>Question paper pattern: The question paper will have ten questions. There will be 2 questions from each module, covering all the topics from a module. The students will have to answer 5 full questions, selecting one full question from each module.</p> | |
| <p>Text Books: 1. Tom M. Mitchell, “Machine Learning”, McGraw-Hill Education(INDIAN EDITION),2013.</p> | |
| <p>Reference Books: 1. Ethem Alpaydin, “ Introduction to Machine Learning”, 2nd Ed., PHI Learning Pvt. Ltd.,2013. 2. T. Hastie,R. Tibshirani, J.H .Friedman, “The Elements of Statistical Learning”,Springer;1st edition,2001.</p> | |

| Course outcomes: | | | |
|---|------------|--|---------------------|
| On completion of the course, the student will have the ability to: | | | |
| Course Code | CO# | Course Outcome (CO) | Blooms Level |
| 22PCS22 | CO1 | Choose the learning techniques with this basic knowledge. | C3 |
| | CO2 | Apply effectively neural networks and genetic algorithms for designing an application. | C5 |
| | CO3 | Illustrate Bayesian techniques and derive effectively learning rules. | C3 |
| | CO4 | Describe instant based learning and rule sets. | C2 |
| | CO5 | Choose and differentiate inforcement and analytical learning techniques | C4 |

| | | |
|---|--------------|-----------------------|
| Course Title: MANAGING BIG-DATA | | |
| Subject Code: 22PCS231 | Credit:3 | CIE:50 |
| Number of Lecture Hours/Week | 3 Hrs | SEE:50 |
| Total Number of Lecture Hours | 42 | SEE Hours:03 |
| Pre-requisite: Data Mining | | |
| Course Objectives: | | |
| <ul style="list-style-type: none"> To understand Big-data and Analytics Ability to use NoSQL tools for Big-data applications. | | |
| MODULES | | Teaching Hours |
| Module-I | | |
| <p>UNDERSTANDING BIG DATA: Types of digital data, classification of data, introduction to big data, characteristics of big data, evolution of big data, definition of big data, challenges with big data, traditional business intelligence (BI) versus big data, what is new today. Big data analytics, big data analytics isn't, classification of big data analytics, greatest challenges that prevent business from capitalization on big data, top challenges facing big data why big data analytics important, data sciences, data scientist, terminologies, used in big data.</p> | | 08 Hrs |
| Module-II | | |
| <p>NOSQL DATABASE: Introduction to NoSQL types of NoSQL Databases, why NoSQL, advantages of NoSQL and its use of NoSQL in industry SQL versus NoSQL, new SQL, comparison of SQL, NoSQL, new SQL. Introduction to MongoDB, why and what MongoDB ,RDBMS and MongoDB, data types in MongoDB, MongoDB query language.</p> | | 08 Hrs |
| Module-III | | |
| <p>BASICS OF HADOOP: Data format–analyzing data with Hadoop, scaling out , Hadoop streaming, Hadoop pipes, design of Hadoop distributed file system(HDFS), HDFS concepts, Java interface, data flow, Hadoop I/O, data integrity, compression, serialization Avro, file- based data structures</p> | | 08Hrs |
| Module-IV | | |
| <p>MAP REDUCE APPLICATIONS: Map Reduce work flows-anatomy of Map Reduce job run, classic Map-reduce, YARN, failures in classic Map-reduce and YARN, job scheduling, shuffle and sort–task execution, Map Reduce types, input formats, output formats.</p> | | 09hrs |
| Module- V | | |
| <p>HADOOPRELATED TOOLS: Hbase, data model and implementations, Hbase clients, Hbase examples, praxis. Hadoop integration. Pig –Grunt–pig</p> | | 09Hrs |

| Data model, Pig Latin, developing and testing Pig Latin scripts. Hive, data Types and file formats, Hive QL data definition, Hive QL data manipulation, Hive QL queries. | | | |
|--|-----|--|--------------|
| <p>Question paper pattern: The question paper will have ten questions. There will be 2 questions from each module, covering all the topics from a module. The students will have to answer 5 full questions, selecting one full question from each module.</p> | | | |
| <p>Textbooks: 1. Seema Acharaya and Subhashini Chellappan “Big Data and analytics”,Wiley2017 2. TomWhite,"Hadoop:TheDefinitiveGuide",ThirdEdition,O'Reilley,2012.</p> | | | |
| <p>Reference: 1. P.J. Sadalage and M.Fowler, "No SQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence", Addison-WesleyProfessional,2012. 2. Eric Sammer, "Hadoop Operations",O'Reilley,2012. 3. E. Capriolo, D. Wampler, and J.Rutherglen," Programming Hive",O'Reilley,2012. 4. Lars George, "HBase: The Definitive Guide", O'Reilley,2011. 5. Eben Hewitt , "Cassandra: The Definitive Guide",O'Reilley,2010. 6. Alan Gates,"ProgrammingPig",O'Reilley,2011. 7. Michael Minelli, Michelle Chambers, and Ambiga Dhiraj," Big Data, Big Analytics:</p> | | | |
| <p>Course outcomes: On completion of the course, the student will have the ability to:</p> | | | |
| Course Code | CO# | Course Outcome(CO) | Blooms Level |
| 22PCS231 | CO1 | Describe big data and use cases from selected business domains | C2 |
| | CO2 | Explain NoSQL big data management. | C2 |
| | CO3 | Install, configure and run Hadoop and HDFS | C3 |
| | CO4 | Perform map- reduce analytics using Hadoop. | C3 |
| | CO5 | Discuss related Hadoop tools such as Hbase, Pig and Hive, | C2 |

| Course Title: SERVICE ORIENTED ARCHITECTURE | | |
|--|--------------|-----------------------|
| SubjectCode: 22PCS232 | Credits:3 | CIE:50 |
| Number of Lecture Hours/Week | 3 Hrs | SEE:50 |
| Total Number of Lecture Hours | 42 | SEE Hours:03 |
| Prerequisites: Java, XML and Web designing | | |
| Course objectives: <ul style="list-style-type: none"> To understand the basic concepts of SOA. To learn Web services and messaging with SOA. To learn about Service oriented Analysis and Design .NET, Java and WS Specification Standards. | | |
| MODULES | | Teaching Hours |
| Module- I | | |
| INTRODUCTION Roots of SOA , Characteristics of SOA , Comparing SOA to client-server and distributed internet architectures , Anatomy of SOA, How components in an SOA interrelate, Principles of service orientation | | 08 Hrs |
| Module-II | | |
| SERVICE ORIENTED ARCHITECTURE IN WEB SERVICES: Web services , Service descriptions , Messaging with SOAP , Message exchangePatterns,Coordination,AtomicTransactions,Businessactivities,43Orchestration , Choreography , Service layer abstraction, Application Service Layer, Business Service Layer, Orchestration Service Layer | | 09 Hrs |
| Module-III | | |
| BUILDING SOA :Service oriented analysis , Business-centric SOA , Deriving business services, service modeling ,Service Oriented Design, WSDL basics, SOAP basics , SOA composition guidelines ,Entity-centric business service design, Application service design, Task centric business service design. | | 08 Hrs |
| Module- IV | | |
| SOA PLATFORMS : SOA platform basics , SOA support in J2EE :Java API for XML-based web services (JAX-WS) , Java architecture for XML binding(JAXB) ,Java API for XML Registries JAXR), Java API for XML basedRPC(JAX-RPC),WebServicesInteroperabilityTechnologies(WsIT),SOA Support in .NET: Common Language Runtime, ASP.NET web forms, ASP .NET web services, Web Services Enhancements (WSE). | | 08 Hrs |
| Module- V | | |
| SOA DESIGN Web Service, BPEL-process, elements, functions, Web Service Coordination overview elements, web service business activity & atomic transaction coordination type , Business process design Web Service, Choreography, Web Service, Policy-elements , Web Service Security, XML – Signature element | | 09 Hrs |
| Question paper pattern: | | |
| The question paper will have ten questions. | | |
| There will be 2 questions from each module, covering all the topics from a module. | | |
| The students will have to answer 5 full questions, selecting one full question from each module. | | |

Textbook:

1. Thomas Erl, "Service-Oriented Architecture: Concepts, Technology, and Design", Pearson Education, 2009.

REFERENCEBOOK

1. Newcomer, Lomow, "Understanding SOA with Web Services", Pearson Education, 2005.
2. Sandeep Chatterjee, James Webber, "Developing Enterprise Web Services, An Architect's Guide", Pearson Education, 2005

Course outcomes:

On completion of the course, the student will have the ability to:

| Course Code | CO# | Course Outcome (CO) | Blooms Level |
|--------------------|------------|--|---------------------|
| 22PCS232 | CO1 | Gain the knowledge of basic concepts of SOA. | C2 |
| | CO2 | Explain advanced concepts of service composition, orchestration, choreography and Web Service frame-work | C5 |
| | CO3 | Discuss various Service Oriented analysis techniques and service design. | C2 |
| | CO4 | Experiment on creation of SOA Web Service using various technologies | C3 |
| | CO5 | Describe Open Standards available for developing SOA compliant Web Services | C2 |

| | | |
|--|-----------------|-----------------------|
| Course Title: SOFTWARE ENGINEERING AND QUALITY ASSURANCE | | |
| SubjectCode: 22PCS233 | Credit:3 | CIE:50 |
| Number of Lecture Hours/Week | 3 Hrs | SEE:50 |
| Total Number of Lecture Hours | 42 | SEE Hours:03 |
| Pre-requisite: Software Engineering and Testing. | | |
| Course Objectives: | | |
| <ul style="list-style-type: none"> • To understand software development, management, deployment of software • To demonstrate software testing methods • Discuss quality assurance and management of software product. | | |
| MODULES | | Teaching Hours |
| Module-I | | |
| <p>Software Processes and Project Management & S/W requirement: Software Process Models, Process Iteration, Process Activities, The Rational Unified Process, Computer Aided Software Engineering. Project Management: Management Activities, Project Planning, Project Scheduling, Risk Management.</p> <p>Requirements Engineering: Software Requirements: Functional and Non-functional requirements, User Requirements, System Requirements, Interface specification, The software requirement Document. Requirements Engineering Processes: Feasibility studies, Requirements elicitation and analysis, Requirements validation, Requirements management.</p> | | 08 Hrs |
| Module-II | | |
| <p>Design Engineering & requirement Engg process: Architectural Design– Architectural Design Decisions, System Organization, Modular decomposition styles, Control Styles. Object-oriented design: Object and Object classes, An Object-oriented design process, Design Evolution. Real-Time Software design: System design, Real-time operating systems, Monitoring and control systems, Data acquisition systems.</p> | | 08 Hrs |
| Module-III | | |
| <p>Software Development and Management: Rapid Software Development-Agile methods, Extreme Programming, Rapid Application Development, Software Prototyping. Computer Based software engineering: Components and Component models, The CBSE process, Component composition. Managing People: Selecting Staff, Motivating People, Managing groups, The people Capability Maturity Model. Software cost estimation: Software productivity, Estimation techniques, Algorithmic Cost modeling, Project duration and staffing.</p> | | 08 Hrs |
| Module-IV | | |
| <p>Testing Strategies: A strategic approach to Software Testing, Strategic Issues, Unit Testing, Integration Testing, Validation Testing, System Testing, Theart of Debugging.</p> <p>Testing Techniques: Software testing fundamentals, Test case Design, White Box testing, Basis Path testing, Control Structure Testing, Black Box Testing, Testing for</p> | | 09 hrs |

| Specialized Environments, Architectures and Applications. | | | |
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| Module– V | | 09 Hrs | |
| <p>Product Metrics: Software Quality, A framework for Product Metrics, Metrics for Analysis Model, Metrics for the Design Model, Metrics for Source Code, Metrics for Testing, Metrics for Maintenance.</p> <p>Quality Management: Quality Concepts, Software Quality Assurance, Software Reviews, Formal Technical Reviews, Formal approaches to SQA, Statistical Software Quality Assurance, Software Reliability, The ISO 9000 Quality Standards, The SQA Plan.</p> | | | |
| <p>Question paper pattern: The question paper will have ten questions. There will be 2 questions from each module, covering all the topics from a module. The students will have to answer 5 full questions, selecting one full question from each module.</p> | | | |
| <p>Text Books: 1. SoftwareEngineering,Sommerville,EighthEdition,PearsonEducation,2009 2. SoftwareEngineering:APractitioner’sApproach,RogerSPressman,TataMcGraw-HillSixthedition,2005.</p> | | | |
| <p>Reference Books: 1. Richard Fairley,“ Software Engineering Concepts” –,TataMcgrawHill,2008. 2. Ian Sommer ville,“SoftwareEngineering”,SeventhEdition,PearsonEducationAsia,2007. 3. Gopala swamy Ramesh, Ramesh Bhattiprolu,“ Software Maintenance” Tata McgrawHill,2003. 4. Shari Lawrence Pfleeger, Joanne M .Atlee “Software Engineering Theory and Practice” , Third Edition, Pearson Education,2006. 5. Alistair Cockburn, "Agile Software Development”, First Edition, Pearson Education Asia,2001. 6. Hans Vanb Vliet “Software Engineering: Principles and Practices”–,Wiley; 3 edition,2008.</p> | | | |
| <p>Course outcomes: On completion of the course, the student will have the ability to:</p> | | | |
| Course Code | CO# | Course Outcome(CO) | Blooms Level |
| 22PCS233 | CO1 | Select and implementation of different software development process models. Extract and analyze software requirements specifications for real time problems. | C4 |
| | CO2 | Develop some basic level of software architecture/ design and Defining the basic concepts and importance of Software project management concepts like cost estimation, scheduling and reviewing the progress | C3 |
| | CO3 | Apply different testing and debugging techniques and analyzing their effectiveness. | C3 |
| | CO4 | Describe the Knowledge of software risks and risk management strategies | C2 |
| | CO5 | Demonstrate software quality measurement metrics. | C4 |

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|--|-----------------|-----------------------|
| Course Title: ADVANCED OPERATING SYSTEM | | |
| SubjectCode: 22PCS234 | Credit:3 | CIE:50 |
| Number of Lecture Hours/Week | 3 Hrs | SEE:50 |
| Total Number of Lecture Hours | 42 | SEE Hours:03 |
| Pre-requisite: Concepts of OS knowledge of UNIX and C Programming | | |
| Course Objectives: | | |
| <ul style="list-style-type: none"> • Main concepts of advanced OS (Parallel processing system • Distributed System , real time system , network operating system | | |
| MODULES | | Teaching Hours |
| Module-I | | |
| Operating System Overview, Process description & control: Operating System Objectives and Functions, The Evolution of Operating Systems, Major Achievements, Developments Leading to Modern Operating Systems, Microsoft Windows Overview, Traditional UNIX Systems, Modern UNIX Systems, Linux, What is Process, Process States, Process Description, Process Control, Execution of the Operating System, Security Issues, UNIX SVR4 Process Management. | | 08 Hrs |
| Module-II | | |
| Threads, SMP and Microkernel, Virtual Memory: Processes and Threads, Symmetric Multiprocessing (SMP), Microkernels, Windows Vista Thread and SMP Management, Solaris Thread and SMP Management, Linux Process and Thread Management. Hardware and Control Structures, Operating System Software, UNIX and Solaris Memory Management, Linux Memory Management, Windows Vista Memory Management, Summary. | | 08 Hrs |
| Module-III | | |
| Multiprocessor and Real-Time Scheduling: Multiprocessor Scheduling, Real-Time Scheduling, Linux Scheduling, UNIX PreclS1) Scheduling, Windows Vista Scheduling, Process Migration, Distributed Global States, Distributed Mutual Exclusion, Distributed Deadlock. | | 08 Hrs |
| Module-IV | | |
| Embedded Operating Systems: Embedded Systems, Characteristics of Embedded Operating Systems, eCOS, Tiny OS, Computer Security Concepts, Threats, Attacks, and Assets, Intruders, Malicious Software Overview, Viruses, Worms ,and Bots, Rootkits. | | 09 Hrs |
| Module- V | | |
| Kernel Organization: Using Kernel Services, Daemons, Starting the Kernel, Controlling the Machine, Modules and Device Management, Module Organization, Module Installation and Removal, Process and Resource Management, Running Process, Manager, Creating a new Task, IPC and Synchronization, The Scheduler, Memory Manager, The Virtual Address Space, The Page Fault Handler, File Management | | 09 Hrs |
| The windows NT/2000/XP kernel: Introduction, The NT kernel, Objects, Threads, Multiplication Synchronization, Traps, Interrupts and Exceptions, The NT executive, Object Manager, Process and Thread Manager, Virtual Memory, Manager, I/o Manager, The cache Manager , Kernel local procedure calls and IPC, The native API, subsystems. | | |

Question paper pattern:

The question paper will have ten questions.

There will be 2 questions from each module, covering all the topics from a module.

The students will have to answer 5 full questions, selecting one full question from each module.

Textbooks:

1. William Stallings: Operating Systems: Internals and Design Principles, 6th Edition, Prentice Hall,2013.
2. Gary Nutt: Operating Systems, 3rd Edition, Pearson,2014

Reference Books:

1. Silberschatz, Galvin, Gagne: Operating System Concepts, 8th Edition, Wiley,2008
2. Andrew S. Tanenbaum, Albert S. Woodhull: Operating Systems, DesignandImplementation,3rd Edition, Prentice Hall, 2006.
3. Pradeep K Sinha: Distribute Operating Systems, Concept and Design, PHI,2007

Course outcomes:

On completion of the course, the student will have the ability to:

| Course Code | CO# | Course Outcome(CO) | Blooms Level |
|-------------|-----|---|--------------|
| 22PCS234 | CO1 | Familiarize concepts of OS ,Process description and control | C2 |
| | CO2 | Illustrate the use of threads , SMP micro kernel and virtual memory algorithms | C4 |
| | CO3 | Analysis of multiprocessor scheduling and real time scheduling algorithms | C4 |
| | CO4 | Experiment the use of embedded operating system | C3 |
| | CO5 | Demonstration of kernel organization of Tarps, Interrupts and Exception (Windows NT/ 2000 / XP/ kernel) | C5 |

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|---|--------------|-----------------------|
| Course Title: ADVANCED DATABASE MANAGEMENT SYSTEMS | | |
| SubjectCode: 22PCS241 | Credit: 3 | CIE:50 |
| Number of Lecture Hours/Week | 3 Hrs | SEE:50 |
| Total Number of Lecture Hours | 42 | SEE Hours:03 |
| Pre requisites: Database Management Systems | | |
| Course Objectives: | | |
| <ul style="list-style-type: none"> • Understand Relational data model and Object-Oriented Database. • Gain Knowledge about parallel Database, Data mining and Data warehouse • Compare Advanced applications of the Database. | | |
| MODULES | | Teaching Hours |
| Module-I | | |
| Review of Relational Data Model and Relational Database Constraints: Relational model concepts, Relational model constraints and relational data base schemas; Update operations, transactions and dealing with constraint violations. Object and Object-Relational Databases: Overview of Object-Oriented Concepts–Objects, Encapsulation, Type and class hierarchies. | | 08 Hrs |
| Module-II | | |
| Complex objects; Object model of ODMG, Object definition Language ODL; Object Query Language OQL; Overview of C++ language binding; Conceptual design of Object data base. Overview of object relational features of SQL; Object-relational features of Oracle; Implementation and related issues for Extended type systems, the nested relational model. | | 09 Hrs |
| Module-III | | |
| Enhanced Data Models for Some Advanced Applications: Active database concepts and triggers; Temporal, Spatial and Deductive Databases–Basic concepts, Parallel and Distributed Databases: Architectures for parallel databases; Parallel query evaluation; Parallelizing individual operations; Parallel query optimizations. | | 08 Hrs |
| Module-IV | | |
| Introduction to distributed databases: Distributed DBMS architectures; Storing data in a Distributed DBMS; Distributed catalog management; Distributed Query processing; Updating distributed data; Distributed transactions; Distributed Concurrency control and Recovery. Data Warehousing, Decision Support and Data Mining: Introduction to decision support; OLAP, multidimensional model; Window queries in SQL; Finding answers quickly; Implementation techniques for OLAP; Data Warehousing; Views and Decision support; View materialization; Maintaining materialized views. | | 09hrs |

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| Module-V | 08Hrs |
| Introduction to Data Mining: Counting co-occurrences; Mining for rules; Tree-structured rules; Clustering; Similarity search over sequences; Incremental mining and data streams; Additional data mining tasks. More Recent Applications: Mobile databases; Multimedia databases; Geographical Information Systems; Genome data management. | |

Question paper pattern:

The question paper will have ten questions.

There will be 2 questions from each module, covering all the topics from a module.

The students will have to answer 5 full questions, selecting one full question from each module.

Text Books:

1. Elmasri and Navathe, *Fundamentals of Database Systems*, Pearson Education, 2007.
2. Raghu Ramakrishnan and Johannes Gehrke, *Database Management Systems*, 3rd Edition, McGraw-Hill, 2003.

Reference Books:

1. Abraham Silberschatz, Henry F. Korth, S.Sudarshan, *Database System Concepts*, 6th Edition, McGraw Hill, 2010.
2. Connolly and Begg, *Database Systems*, 4th Edition, Pearson Publications, 2005.

Course outcomes:

On completion of the course, the student will have the ability to:

| Course Code | CO# | Course Outcome(CO) | Blooms Level |
|-----------------|------------|--|--------------|
| 22PCS241 | CO1 | Demonstrate Relational Data Model and Relational Database Constraints | C3 |
| | CO2 | Design ODBMS using Object Query Language | C5 |
| | CO3 | Develop Data models using active Database and Parallel and Distributed Databases | C5 |
| | CO4 | Demonstrate Data ware housing concepts | C3 |
| | CO5 | Discuss Rules and Applications on Data mining | C2 |

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|---|--------------|-----------------------|
| Course Title: STORAGE AREA NETWORK | | |
| SubjectCode: 22PCS242 | Credit:3 | CIE:50 |
| Number of Lecture Hours/Week | 3 Hrs | SEE:50 |
| Total Number of Lecture Hours | 42 | SEE Hours:03 |
| Prerequisites: Operating System and Computer Networks. | | |
| Course Objectives: | | |
| <ul style="list-style-type: none"> • Understand fundament also of storage centric and server centric systems. • Learn metrics used for designing storage area networks, RAID concepts. • Describe back up and remote mirroring concepts | | |
| MODULES | | Teaching Hours |
| Module-I | | |
| <p>Introduction: Server Centric IT Architecture and its Limitations; Storage–Centric IT Architecture and its advantages. Case study: Replacing a server with Storage Networks The Data Storage and Data Access problem; The Battle for size and access. Intelligent Disk Subsystems: Architecture of Intelligent Disk Subsystems; Hard disks and Internal I/O Channels; JBOD, Storage virtualization using RAID and different RAID levels; Caching: Acceleration of Hard Disk Access; Intelligent disk subsystems, Availability of disk subsystems.</p> | | 09 Hrs |
| Module-II | | |
| <p>I/O Techniques: The Physical I/O path from the CPU to the Storage System; SCSI; Fibre Channel Protocol Stack; Fibre Channel SAN; IP Storage. Network Attached Storage: The NAS Architecture, The NAS hardware Architecture, The NAS Software Architecture, Network connectivity, NAS as a storage system. File System and NAS: Local File Systems; Network file Systems and file servers; Shared Disk file systems; Comparison of fibre Channel and NAS.</p> | | 08 Hrs |
| Module-III | | |
| <p>Storage Virtualization: Definition of Storage virtualization; Implementation Considerations; Storage virtualization on Block or file level; Storage virtualization on various levels of the storage Network; Symmetric and Asymmetric storage virtualization in the Network.</p> | | 08 Hrs |
| Module-IV | | |
| <p>SAN Architecture and Hardware devices: Overview, Creating a Network for storage; SAN Hardware devices; The fibre channel switch; Host Bus Adaptors; Putting the storage in SAN; Fabric operation from a Hardware perspective. Software Components of SAN: The switch’s Operating system; Device Drivers; Supporting the switch “components; Configuration options for SANs.</p> | | 09 Hrs |
| Module- V | | |
| <p>Management of Storage Network: System Management, Requirement of management System, Support by Management System, Management Interface,</p> | | |

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|--|---------------|
| Standardized Mechanisms, Property Mechanisms, In-band Management, Use of SNMP, CIM and WBEM, Storage Management Initiative Specification (SMI-S), CMIP and DMI, Optional Aspects of the Management of Storage Networks, Summary. | 08 Hrs |
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Question paper pattern:

The question paper will have ten questions.
 There will be 2 questions from each module, covering all the topics from a module.
 The students will have to answer 5 full questions, selecting one full question from each module.

Textbooks:

1. Ulf Toppens, Rainer Erkens and Wolfgang Muller: Storage Networks Explained, Wiley India, 2013.

Reference Books:

1. Robert Spalding: "Storage Networks The Complete Reference", Tata McGraw-Hill, 2011.
2. Marc Farley: Storage Networking Fundamentals—An Introduction to Storage Devices, Subsystems, Applications, Management, and File Systems, Cisco Press, 2005.
3. Richard Barker and Paul Massiglia: "Storage Area Network Essentials A Complete Guide to Understanding and Implementing SANs", Wiley India, 2006.

Course outcomes:

On completion of the course, the student will have the ability to:

| Course Code | CO# | Course Outcome(CO) | Blooms Level |
|-----------------|------------|--|--------------|
| 22PCS242 | CO1 | Describe server storage- and types of centric architecture intelligent subsystems and their usage. | C2 |
| | CO2 | Describe I/O techniques, NAS and Files system. | C2 |
| | CO3 | Demonstrate storage virtualization on various levels of the storage networks. | C3 |
| | CO4 | Illustrate Hard ware and software components of storage Area Network. | C4 |
| | CO5 | Explain various mechanism of managing SAN. | C6 |

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|---|--------------|-----------------------|
| Course Title: BUSINESS INTELLIGENCE | | |
| SubjectCode: 22PCS243 | Credits:3 | CIE:50 |
| Number of Lecture Hours/Week | 3 Hrs | SEE:50 |
| Total Number of Lecture Hours | 42 | SEE Hours:03 |
| Prerequisite: Basic understanding of computer technology. | | |
| Course objectives: | | |
| <ul style="list-style-type: none"> • Introduce the concepts and components of Business Intelligence (BI) • Evaluate the technologies that make up BI (data warehousing, OLAP) • Define how BI will help an organization and whether it will help yours • Identify the technological architecture that makes up BI systems • Plan the implementation of a BI system | | |
| MODULES | | Teaching Hours |
| Module-I | | |
| Development Steps, BI Definitions, BI Decision Support Initiatives, Development Approaches, Parallel Development Tracks, BI Project Team Structure, Business Justification, Business Divers, Business Analysis Issues, Cost–Benefit Analysis, Risk Assessment, Business Case Assessment Activities, Roles Involved In These Activities, Risks Of Not Performing Step, Hardware, Middleware, DBMS Platform, Non Technical Infrastructure Evaluation. | | 09 Hrs |
| Module-II | | |
| Managing The BI Project, Defining And Planning The BI Project, Project Planning Activities, Roles And Risks Involved In These Activities, General Business Requirement, Project Specific Requirements, Interviewing Process. | | 09 Hrs |
| Module-III | | |
| Differences in Data base Design Philosophies, Logical Data base Design, Physical Database Design, Activities, Roles and Risks Involved In These Activities, Incremental Rollout, Security Management, Database Backup and Recovery | | 08 Hrs |
| Module-IV | | |
| Growth Management, Application Release Concept, Post Implementation Reviews, Release Evaluation Activities, The Information Asset and Data Valuation, Actionable Knowledge– ROI, BI Applications, The Intelligence Dashboard | | 08 Hrs |
| Module–V | | |
| Business View of Information technology Applications: Business Enterprise excellence, Key purpose of using IT, Type of digital data, basics o f enterprise reporting, BI road ahead | | 08 Hrs |
| Question paper pattern: | | |
| The question paper will have ten questions. | | |
| There will be 2 questions from each module, covering all the topics from a module. | | |
| The students will have to answer 5 full questions, selecting one full question from each module. | | |

Text Books:

1. Larissa T Moss and Shaku Atre–Business Intelligence Roadmap: The Complete Project Life cycle for Decision Support Applications, Addison Wesley Information Technology Series, 2003.
2. R N Prasad, Seema Acharya–Fundamentals of Business Analytics, Wiley India, 2011.

Reference Books:

1. David Loshin-Business Intelligence: The Savvy Manager's Guide, Publisher: Morgan Kaufmann, ISBN1-55860-196-4.
2. Brian Larson- Delivering Business Intelligence with Microsoft SQL Server 2005, McGraw Hill, 2006.
3. Lynn Langit- Foundations of SQL Server 2008 Business Intelligence – A press, ISBN 13:978-1-4302-3324-4, 2011

Course outcomes:

On completion of the course, the student will have the ability to:

| Course Code | CO# | Course Outcome(CO) | Blooms Level |
|-------------|-----|---|--------------|
| 22PCS243 | CO1 | Analyze the complete life cycle of BI / analytical development | C2 |
| | CO2 | Defining and summarize the planning , managing the BI Projects | C4 |
| | CO3 | Differentiate in database design philosophies roles risk involved in data base management | C2 |
| | CO4 | Illustrate technology and process associated with BI frame work. | C5 |
| | CO5 | Identify and analyse the business enterprise excellence and type of digital data. | C5 |

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| Course Title: COMPILER DESIGN | | |
| Subject Code: 22PCS244 | Credits:3 | CIE:50 |
| Number of Lecture Hours/Week | 3 Hrs | SEE:50 |
| Total Number of Lecture Hours | 42 | SEE Hours:03 |
| Prerequisite: FAFL , C Programming, Data Structures | | |
| Course objectives: | | |
| <ul style="list-style-type: none"> • To understand the working of all the phases compiler. • Learn to build a simple compiler. | | |
| MODULES | | Teaching Hours |
| Module-I | | |
| Introduction: Need for compilers, Programs Related to compilers, Translation process, and Major Data structure in compiler, Bootstrapping and porting Lexical analysis: Scanning process, Regular Expressions, Finite Automata, From regular expressions to DFA, Specifications of Tokens, Recognition of Tokens. | | 09Hrs |
| Module-II | | |
| Syntax Analysis: Parsing process, context free grammars, parse tree , ambiguity Top-down Parsing: Recursive descent parsing, LL(1)parsing. Bottom-up Parsing: Overview of Bottom-up Parsing, Simple LR Parser(SLR(1). | | 09Hrs |
| Module-III | | |
| More powerful parsers: LR(1),LALR(1)parsing | | 08Hrs |
| Module-IV | | |
| Semantic Analysis: Attributes and Attributes grammars, Algorithm for attribute computation, Symbol table, data types and Data checking | | 08 Hrs |
| Module-V | | |
| Code Generation: Intermediate Code and data structure for code generation, Code generation of data structure references, code generation of control statements and expressions. | | 08 Hrs |
| Question paper pattern: | | |
| The question paper will have ten questions. | | |
| There will be 2 questions from each module, covering all the topics from a module. | | |
| The students will have to answer 5 full questions, selecting one full question from each module. | | |
| Text Books: | | |
| <ol style="list-style-type: none"> 1. Kenneth C Loudon:CompilerConstructionPrinciples&Practice,CengageLearning,1997 2. Alfred V Aho,Monica S. Lam, Ravi Sethi, Jeffrey D Ullman: Compilers-Principles, Techniques and Tools, 2nd Edition, Pearson, 2007. | | |

Reference Books:

1. Andrew W Apple: Modern Compiler Implementation in C, Cambridge University Press, 1997
2. Charles N. Fischer, Richard J. le Blanc, Jr.: Crafting a Compiler with C, Pearson, 1991.
3. PeterLinz: An Introduction to formal languages and Automata, IV Edn, Narosa, 2009

Course outcomes:**On completion of the course, the student will have the ability to:**

| Course Code | CO# | Course Outcome(CO) | Blooms Level |
|--------------------|------------|---|---------------------|
| 22PCS244 | CO1 | Understanding different phases of compiler and building lexical analyser. | C2 |
| | CO2 | Demonstrating syntax analysis and design top-down and bottom up parsers | C4 |
| | CO3 | Designing LR (1), LALR (1) Prsess. | C2 |
| | CO4 | Demonstraing semantic analysis | C5 |
| | CO5 | Illustrating the process of code generation | C5 |

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| Course Title: INTERNET OF THINGS AND DATA ANALYTICS LABORATORY | | |
| Subject Code: 22PCS26 | Credit:2 | CIE:50 |
| Number of Practical Hours /Week /batch | 2 Hrs | SEE:50 |
| | | SEEHours:03 |
| Pre-requisite: Programming language – C++, Java | | |
| Course Objectives: | | |
| <ul style="list-style-type: none"> • To introduce different architectures used for connected smart devices • To study various protocols used in the Internet of Things environment • To Design and Develop Internet of Things based solution for real world problems | | |
| List of Programs | | |
| <p>I) IoT Data Capturing and IoT Data storage</p> <p>II) IoT Data Analytics</p> <p>I) IoT Data Capturing and IoT Data storage</p> <p>a. Develop a data capturing system for following purpose:</p> <ol style="list-style-type: none"> i. Atmospheric Temperature and Humidity data from two location of PDA campus with and interval of 30 mins data publication, store data in data server. ii. Light intensity – 1 hour time interval iii. Water flow iv. Hall entry count v. Count of items passing on a conveyor belts vi. Vehicle passing counter <p>b. Prepare code to store data in Mango DB</p> <p>c. Store data in Hadoop and analyses using MAP REDUCE</p> <p>d. Store data in Thingspeak</p> <p>II) Use MATLAB tools to analyse data form Thingspeak</p> <p>III) Use APP Designer to build Apps for above System.</p> | | |
| Question paper pattern: | | |
| For SEE similar question related to the above programs will be asked. | | |

| Course outcomes: On completion of the course, the student will have the ability to: | | | |
|--|------------|--|---------------------|
| Course Code | CO# | Course Outcome (CO) | Blooms Level |
| 22PCS26 | CO1 | Develop data capturing system for real time applications. | C5 |
| | CO2 | Analyze the captured data stored in server. | C6 |
| | CO3 | Prepare a code to demonstrate MONGODB, HADOOP and MAP REDUCE tools. | C4 |
| | CO4 | Develop a system to capture the sensor data and store in Thingspeak. | C5 |
| | CO5 | Analyze Thingspeak data using MATLAB TOOL. | C6 |